

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:
a semiconductor substrate;

5 a transistor comprising a gate insulation film on
the semiconductor substrate and a gate electrode on the
gate insulation film; and

a device isolating insulation film comprising a
first portion which extends from a surface of the
semiconductor substrate to an inner part of the
10 semiconductor substrate and a second portion which
protrudes from the semiconductor substrate, wherein a
side surface of the second portion is in direct contact
with a side surface of the gate electrode at least
partially and a cross section of the gate electrode is
15 reverse tapered.

2. The device according to claim 1, wherein the
gate electrode constitutes at least a portion of a
floating gate electrode, and the transistor further
comprising an interlayer gate insulation film on the
20 floating gate electrode and a control gate electrode on
the interlayer insulation film.

3. The device according to claim 2, wherein a
side surface of the first portion on the gate electrode
side is disposed discontinuously with the side surface
25 of the second portion on the gate electrode side, and a
width of the second portion is larger than a width of
the first portion.

4. The device according to claim 3, wherein a cross section of the second portion is forward tapered.

5. The device according to claim 1, wherein a side surface of the first portion on the gate electrode side is disposed discontinuously with the side surface of the second portion on the gate electrode side, and a width of the second portion is larger than a width of the first portion.

6. The device according to claim 1, wherein a cross section of the second portion is forward tapered.

7. A method of manufacturing a semiconductor device comprising:

forming a laminate structure comprising a gate insulation film on a semiconductor substrate and a gate electrode material film on the gate insulation film;

processing the gate electrode material film to obtain a gate electrode having a reverse tapered cross section; and

forming a device isolating insulation film being in direct contact with a side surface of the gate electrode.

8. The method according to claim 7 further comprising, after the formation of the device isolating insulation film, removing a portion of the gate electrode to divide the gate electrode into a plurality of portions.

9. The method according to claim 7, wherein the

processing of the gate electrode material film
comprises:

5 partially removing each of the semiconductor
substrate, the gate insulation film and the gate
electrode material film to obtain a groove, a bottom of
the groove being constituted by the semiconductor
substrate and sidewalls of the groove being constituted
by the semiconductor substrate, the gate insulation
film and the gate electrode.

10 10. The method according to claim 9, wherein the
formation of the device isolating insulation film
comprises:

15 forming a first device isolating insulation film
on each of the sidewalls such that the first device
isolating insulation film becomes thinner toward an
opening of the groove; and

forming a second device isolating insulation film
in the groove after the formation of the first device
isolating insulation film.

20 11. The method according to claim 10, wherein the
first device isolating insulation film is formed by
means of a deposition method.

25 12. The method according to claim 10, wherein the
gate electrode is formed by anisotropically etching the
gate electrode material film.

13. The method according to claim 9, wherein the
partial removal for obtaining the groove is performed

such that a width of the groove becomes wider toward an opening of the groove.

14. The method according to claim 7, wherein the processing of the gate electrode material film
5 comprises:

partially removing the gate electrode material film to obtain a groove, a bottom of the groove being constituted by the semiconductor substrate and sidewalls of the groove being constituted by the gate
10 electrode.

15. The method according to claim 14, wherein the formation of the device isolating insulation film comprises:

forming a first device isolating insulation film
15 on each of the sidewalls; and

forming a second device isolating insulation film in the groove after formation of the first device isolating insulation film.

16. The method according to claim 15, wherein the
20 first device isolating insulation film is formed by oxidizing a side surface of the gate electrode.

17. The method according to claim 14, wherein the gate electrode is formed by anisotropically etching the gate electrode material film.

25 18. The method according to claim 15, wherein the formation of the second device isolating insulation film is performed such that a bottom of the second

device isolating insulation film is lower in position than a interface between the gate insulation film and the semiconductor substrate.

19. The method according to claim 14, wherein the
5 partial removal of the gate electrode material film is performed such that a width of the groove becomes wider toward an opening of the groove.

20. The method according to claim 15, wherein the
10 first device isolating insulation film is formed by means of a deposition method.